AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Original): A coarse frequency synchronization apparatus in a frequency synchronizer of an orthogonal frequency division multiplexing (OFDM) receiver, the apparatus comprising:

a buffer operable to receive a demodulated symbol and output a shifted symbol generated by cyclically shifting the demodulated symbol by a predetermined shift amount;

a controller operable to determine a length of summation interval according to a phase coherence bandwidth and a number of sub-bands into which the summation interval is divided, and generate and adjust a symbol time offset according to the number of sub-bands;

a reference symbol predistortion portion operable to generate a reference symbol whose phase is distorted by the symbol time offset;

a counter operable to determine the shift amount;

a partial correlation portion operable to receive the shifted symbol and the reference symbol and calculate a partial correlation value for each of the sub-bands; and

a maximum value detector operable to calculate the shift amount where the sum of the partial correlation values is a maximum and output the shift amount as an estimated coarse frequency offset value.

2. (Currently Amended): The apparatus of claim 1, wherein the partial correlation portion is operable to calculate the partial correlation value for each sub-band using the equation $\sum_{m=0}^{K-1}\left|\sum_{k=m(N/K)}^{(m+1)(N/K)-1} X(((k+d))_N)Z^*(k)\right|$ where X(k+d) represents the shifted demodulated symbol, Z(k) represents the reference symbol, N is a number of subcarriers, K is the number ~~od~~ of sub-bands and d is the predetermined shift amount and is a value between $-\frac{2}{N}$ and $\frac{2}{N}$.

3. (Currently Amended): The apparatus of claim 1, wherein the reference symbol predistortion portion comprises:

a reference symbol generator operable to generate a phase reference symbol; and

a phase rotation portion operable to rotate the phase of the phase reference symbol according to the symbol time offset ~~value~~ and output a phase-distorted reference symbol.

4. (Currently Amended): The apparatus of claim 3, wherein the phase rotation portion is operable to generate a complex number corresponding to each of a plurality of subcarriers, by which a phase is rotated, multiply the generated complex number by the phase reference symbol, and generate ~~a~~ the phase-distorted reference symbol.

5. (Original): The apparatus of claim 1, wherein the number of sub-bands is set to be less than $2 \times T_{off}$ where T_{off} is a maximum time offset for which frame synchronization can be achieved.

6. (Currently Amended): A coarse frequency synchronization method for use in an orthogonal frequency division multiplexing (OFDM) receiver for performing OFDM demodulation and frequency synchronization, the method comprising:

(a) receiving a demodulated symbol and outputting a shifted symbol generated by cyclically shifting the demodulated symbol by a predetermined shift amount;

(b) determining the length of a summation interval according to a phase coherence bandwidth and a number of sub-bands into which the summation interval is divided, and generating a predetermined symbol time offset according to the number of sub-bands;

(c) generating a reference symbol whose phase is distorted by the symbol time offset;

(d) counting the shift amount;

(e) calculating a partial correlation value between the shifted symbol and the reference symbol for each of the sub-bands; and

(f) determining the shift amount d where the partial correlation value is a maximum and outputting the shift amount d as an estimated coarse frequency offset value.

7. (Original): The method of claim 6, where in step (e), the partial correlation value is calculated for each sub-band using the equation

$\sum_{m=0}^{K-1} \left| \sum_{k=m(N/K)}^{(m+1)(N/K)-1} X(((k+d))_N)Z^*(k) \right|$ where X(k+d) represents the shifted demodulated symbol, Z(k) represents the reference symbol, N is a number of subcarriers, K is the number of sub-bands and the predetermined shift amount d is a value between $-\frac{2}{N}$ and $\frac{2}{N}$.

8. (Currently Amended): The method of claim 6, wherein ~~in~~ step (c) comprises the steps of:

(c1) generating a phase reference symbol; and

(c2) rotating the phase of the phase reference symbol according to the symbol time offset ~~value~~ and outputting a phase-distorted reference symbol.

9. (Currently Amended): The method of claim 8, wherein in step (c2), a complex number corresponding to each of a plurality of subcarriers, by which a phase is rotated, is generated, and the generated complex number is multiplied by the phase reference symbol to generate ~~a~~ the phase-distorted reference symbol.

10. (Original): The method of claim 6, wherein the number of sub-bands is set to be less than $2 \times T_{off}$ where T_{off} is a maximum time offset for which frame synchronization can be achieved.

11. (Currently Amended): An orthogonal frequency division multiplexing (OFDM) receiver including a coarse frequency synchronization apparatus, the apparatus comprising:

a buffer that receives a demodulated symbol and outputs a shifted symbol generated by cyclically shifting the demodulated symbol by a predetermined shift amount ;

a controller ~~than~~ that determines the length of a summation interval according to a phase coherence bandwidth and a number of sub-bands into which the summation interval is divided, and generates and adjusts a symbol time offset according to the number of sub-bands;

a reference symbol predistortion portion that generates a reference symbol whose phase is distorted by the symbol time offset;

a counter that counts the shift amount;

a partial correlation portion that receives the shifted symbol and the reference symbol and calculates a partial correlation value for each of the sub-bands; and

a maximum value detector that calculates the shift amount d where the partial correlation value is a maximum and outputs the shift amount d as an estimated coarse frequency offset value.

12. (Original): The receiver of claim 11, wherein the partial correlation portion calculates the partial correlation value for each sub-band using the equation

$\sum_{m=0}^{K-1}\left|\sum_{k=m(N/K)}^{(m+1)(N/K)-1} X(((k+d))_N)Z^*(k)\right|$ where X(k+d) represents the shifted demodulated symbol, Z(k) represents the reference symbol, N is a number of subcarriers, K is the number of sub-bands and the predetermined shift amount d is a value between $-\frac{2}{N}$ and $\frac{2}{N}$.

13. (Currently Amended): The receiver of claim 11, wherein the reference symbol predistortion portion comprises:

a reference symbol generator that generates a phase reference symbol; and

a phase rotation portion that rotates the phase of the phase reference symbol according to the symbol time offset ~~value~~ and outputs a phase-distorted reference symbol.

14. (Currently Amended): The receiver of claim 13, wherein the phase rotation portion generates a complex number corresponding to each of a plurality of subcarriers, by which a phase is rotated, multiplies the generated complex number by the phase reference symbol, and generates ~~a~~ <u>the</u> phase-distorted reference symbol.

15. (Original): The receiver of claim 11, wherein the number of sub-bands is set to be less than $2\times T_{off}$ where T_{off} is a maximum time offset for which frame synchronization can be achieved.